The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C. 4

Telegrams: ALLANGAS FLEET LONDON
Telephone: CENTRAL 3212 (10 lines)
GLASGOW: 116, Hope Street, (Central 3970)
BIRMINGHAM: Daimler House, Paradise Street, (Midland 0784-5)
THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. XLV. No. 1156 August 23, 1941 Annual Subscription, 21s. Overseas, 26s.

The Chemical Industry Overseas

WAR is an opportunity that knocks periodically on the door of industry. Under the accelerating influence of war needs, obstacles are swept away, monetary considerations pale into insignificance, economics loses its meaning. Upon those industries that can contribute anything of value for munitions, war (to change our metaphor) acts like a highly potent fertiliser. The British chemical industry, the British glass industry, the manufacture of synthetic ammonia, are just three of the examples that spring to mind as dating their rapid growth from the last war.

It would not be permissible to speak of the present effect of war on the British chemical industry. Information has been published, however, in America which permits the veil to be drawn a little to disclose the general effect upon the American chemical industry. Here is a glimpse of the work being done by one firm of chemical plant manufacturers in that country. This company is now building eleven new by-product coke-oven plants involving 618 ovens with an annual new coke-producing capacity of 3,000,000 tons; also three completely new by-product plants with an aggregate annual production of 48,000,000 gallons of tar and 60,000 tons of sulphate of ammonia. It is constructing seven light-oil recovery and refining plants with a capacity of 28,000,000 gallons of light oil annually. The refined products from these plants will include some 4,000,000 gallons of toluol per year. Also two gas-purification plants operating on oil-refinery gases which will recover sulphur, now wasted, equivalent to 50,000 tons of sulphuric acid per year. Also two coke-oven gas purification plants in which the recovered sulphur is converted into 7500 tons of sulphuric acid per year, while, in addition, 1800 tons of elemental sulphur are produced for agricultural purposes. They have, furthermore, under construction a semi-water gas plant producing 20,000,000 cu. ft. of gas per day which is to be used for the manufacture of synthetic ammonia. In addition, there are several gas-producer plants, tar-distillation units and so forth. Coming to the wider chemical industry, this same concern is building plants for the production of pyridine that are helping to combat the scarcity of that material and to provide an ample supply of pyridine for the medicinals, dyes, and textile chemicals lately discovered for which that substance is an essential raw material. Another activity is the production of materials for the synthesis of certain vitamins to meet the growing demands in the field of vitamin chemistry.

Also under construction is a large new plant which is to provide a reliable, relatively inexpensive source of supply of commercially pure ammonium thiocyanate, and which it is hoped will stimulate investigations into the possibility of wider uses of this substance in the manufacture of resins, inhibitors, and materials for textile finishing, paper making, and agriculture. This company is likewise building plant for new large-scale production of finely divided sulphur for agriculture, the rubber industry and so forth. Unusual tar chemicals offer another new outlet for chemical plant—but why continue the list? Enough has been said to show that the constructional side of the American chemical industry is very active indeed. This firm specialises on chemicals derived from coal; there are others, perhaps, equally wide in scope dealing with other branches of the chemical industry. And, perhaps, the most significant paragraph in the recital occurs at the end: the research department is expanding at an ever-increasing rate.

What will be the ultimate effect of all this effort? Obviously, there will be yet another great expansion of the chemical industry. But there are those who look beyond the war period. Dr. Landis, speaking at the Chicago meeting of the American Institute of Chemical Engineers, pointed out that the real problem of the impact of war on the American chemical industry is economic, inasmuch as the plants now building are large and located in a section of the country that has not attracted the chemical industry previously to any great extent. Large producing units are being set up, many of them in isolated districts, new communities must come into being and will exert political pressure when the emergency is over to keep these plants in operation. This he describes as arbitrary and uneconomical competition in an industry that has proved its ability to take care of all ordinary requirements of the U.S.A.

The problem is not only parochial, or national; it is international. No doubt the German chemical industry has also expanded. So will that of Japan. And that of Great Britain, and of the Dominions and throughout the Empire. All over the world the war is causing an expansion of productive capacity that after the war will arouse in an exaggerated form the problems that of 1919. If the great unsolved problem of those years was that of distributing the goods and thus of raising the standard of living throughout the world, let us not forget that that is a very old problem. Restriction of output is not a solution; it is only a palliative. The flood of chemical progress flows full tide; the task of our generation will be to so direct it that the peoples of the world will have sufficient of every material comfort not to desire to go to war again.

CONTENTS

NOTES AND COMMENTS

State Science Bursaries

RECOGNITION of the need for new scientific talent in industry as well as in the Services is revealed by the Board of Education's new scheme for State bursaries in science, tenable at universities and certain technical colleges. Physics (particularly radio work), chemistry, and engineering are the subjects into which an infusion of new blood is most pressingly required. The bursaries, offered without regard to the financial circumstances of the candidates and their parents, cover fees and full cost of residence at the seat of learning selected. The qualifying standard will be a pass in physics, chemistry, or mathematics in certain combinations in the Higher Certificate examinations. Bursaries will be offered to candidates who have reached the necessary standard in these examinations and applications are also being accepted from boys and girls who have passed the London Intermediate B.Sc. in the appropriate subjects. Young people who have left school and are now in employment and students already at universities will not normally be eligible, and the minimum age is 18, unless the candidate is endowed with exceptional qualifications. It is stated that special arrangements are being made for holders of these bursaries to complete their courses after the war, should they be required for National Service in the meantime. There would appear to be some sort of contradiction involved here, as the bursars would supposedly be in training for National Service, and it would seem a false economy to interrupt half-way a specified course of training and to place a young scientist, specially selected for ability, in a position where his or her qualifications could not be fully utilised. Still, the scheme is a step in the right road, and the Board of Education, in its rural retreat at Branksome Dene Hotel, Bournemouth, will doubtless receive hosts of inquiries from eligible candidates.

Mineral Wool in Sweden

SWEDEN'S geological riches have been famous since the days of Berzelius or earlier, and she has on many occasions had reason to be grateful for the variety of the products of her soil. In latter days, notably, with the greater part of her seaborne commerce cut off, she has had to rely more than ever on her own resources; and an interesting story of an attempt at complete industrial self-sufficiency is told in connection with a new plant at the little town of Skövde, about 27 miles from Gothenburg. This year the factory began producing rock-wool to replace imported insulating and packing materials. The local siliceous and argillaceous dolomite presented certain difficulties of processing, but these were overcome, and the supply of rock in the neighbourhood available for furnacing is said to be sufficient to last a century. Another difficulty arose in connection with the supply of fuel, which would formerly have been entirely imported, and as a temperature of 1525°-1650° C. has to be maintained for atomising the molten rock by a blast of steam under pressure, it will be seen that fuel was an item of the first importance. Nothing daunted, the manufacturers turned to their own soil again, and found that an unlimited supply of oil-bearing shale existed on their property; and an attempt to utilise this is now being made. As there is an increasing need of materials to insulate buildings against cold in North European countries, and as it is reported that there is only one other factory in Europe producing rock-wool (in Denmark), the Swedish enterprise should have no difficulty in disposing of as much of the product as it can prepare.

Industrial Co-operation

JUST a week ago, on August 15 to be precise, a landmark in British industry was reached when the first mutual aid scheme was instituted at Birmingham in the Ministry of Supply's regional office. From five Midland counties more than 40 engineering firms came to a conference with the object of helping each other. Some brought details of cutting tools they urgently needed to rid them of bottle-necks in production; others brought reports of an excess of tools for which they had no immediate use. As a result of this first meeting, more than 100 interchanges of tools were arranged, which it would have taken the makers months to have supplied. Moreover the exchange was accomplished (in the words of Mr. C. MacLaren, the new regional representative of the Ministry of Supply) "without a mass of forms and officials." The scheme was originally conceived by Mr. MacLaren, who has the wholehearted co-operation of the area officers of the Admiralty and Ministry of Aircraft Production, backed by an all-round willingness among local firms to further the success of the plan. Already future meetings are being arranged. To the chemical world, however, a more interesting side of this system of mutual aid is the possibilty of extending it into the realms of labour supply. It is impossible to exchange plant, but surely the interchange of workers between factories where there is a temporary decline in activity and those more pressed does not offer insurmountable difficulties. At any rate we shall watch with interest to see whether Mr. MacLaren's suggestion of "release-and-lend" for employees is successfully adopted among the engineering firms that have now begun the exchange of cutting tools.

Wholesale Prices in July

WHOLESALE prices for industrial materials and manufactures, as measured by the Board of Trade Index Number were slightly higher in July than in June, standing at 156.5 as against 156.1 (1930 = 100); for chemicals and oils the figure was 127.5; for iron and steel 181.3; and for non-ferrous metals 123.8. These figures represent a rise of 0.9 per cent. in chemical prices over June, 1941, and 7.7 per cent. over July, 1940; the rise for the month in iron and steel amounts to only 0.1 per cent.; while non-ferrous metal prices continue along the slight decline which they have shown since last April, the price now standing at precisely the same level as it was in July, 1940. Actually, chemicals and oils show the greatest increase for the month, the price of fuel oil being advanced 1¼d. per gallon (16½ per cent.) on July 9, and that of burning oil ¾d. per gallon (7 per cent.) on July 8. Among chemicals proper, iron sulphate rose 10½ per cent. during the month and aniline oil 5½ per cent., while superphosphates decreased by 17 per cent. and sulphate of ammonia 6 per cent., but these commodities are only fractionally weighted in the index.

PREVENTION OF FOOD SPOILAGE

Preservatives and Wrappings

THE urgent necessity for the preservation of food supplies lends additional interest to a recent paper entitled " Modern Advances in Preventing Food Spoilage " delivered by Dr. William Clayton, D.Sc., F.I.C., head of the Technical Development Department, Metal Box Co., Ltd. Dr. Clayton's paper covers the entire field of food preservation, where, as he says, physical chemistry, biochemistry, bacteriology, mathematics, physics, metallurgy, and engineering are all necessary. The following brief extracts from his paper include only a few of the more strictly chemical aspects of the subject, dealing with the questions of the use of preservatives and the preparation of wrappings.

Natural Preservatives

The restriction on the use of preservatives has led to an examination of natural preservatives. In an examination of the preservative action of spices and related compounds against yeast fermentation, mustard flour was found very effective, followed by cloves and then cinnamon. Practically no benefit is derived by the use of cardamons, cummin, corianders, caraway, celery seed, pimento, nutmeg, ginger, marjoram, savory, rosemary, and peppers. Indeed, these acted as if they contained yeast stimulants. Volatile oil of mustard was a good preservative, being even better than benzoic acid and sulphur dioxide. Cinnamon oil followed it in efficacy, the oils of cloves, thyme, and bay leaves coming next, being approximately equal in power. Similarly, it has been found that the vapours from ground horseradish root exert a marked restraint on bacterial growth, especially at blood heat. The action is selective, *e.g., B. coli* is more resistant to the vapour than is *B. subtilis*.

Lactic acid is excellent as a natural preservative. Thus, in preventing softening of pickles, 0.3 per cent. inhibits the growth of *B. mesentericus fuscus*. Cloudy olives due to yeasts or to a secondary lactic fermentation can also be prevented by acidification with lactic acid. Its use has been extended to meat curing, particularly pork, where the saltpetre/sugar/brine has lactic acid added to 0.1 per cent. Another use of lactic acid is to control " rope " in bread caused by strains of heat-resistant, spore-forming bacilli of the *B. mesentericus* group. Other acids such as acetic, tartaric, and phosphoric, also serve, the dough being acidified to a *p*H ranging from 4.63 to 5.15 according to the acid used.

Limitations of Salt

Salt is ordinarily regarded as an excellent preservative. It has, however, limitations. In the first place, salt in store can act as a deposit for air-borne micro-organisms like moulds, with subsequent ill-consequences in such foods as butter and margarine. More important is the recognition that certain types of micro-organisms only flourish in heavily-salted media. These " halophiles," as they are termed, are frequently chromogenic and their growth colours the food concerned, *e.g.*, " pink-eye " on dry-salted cod. Mainly occurring in solar salt (evaporated sea-water), their origin is most probably sea-water. Halophiles have been observed on occasions to " ferment " anchovy essence, a sauce made by grinding salted anchovies. Baumgartner has described a new species of anærobic halophile obtained from Mediterranean salted anchovies; maximum growth occurs when the salt content of the medium reaches 12.5-15 per cent., and growth is absent when the salt content is less than 4 per cent.

The preservative properties of the sugars in sufficient concentration have long been known, but only in recent years has research correlated this action with the peculiar hydration effect on proteins. It is generally accepted that the lethal effects of heat and disinfectants on micro-organisms are due to the coagulation of protein in the structure of such organisms, and that time and moisture content are important factors.

Moist proteins undergo thermal denaturation better than dry proteins. It is arguable that if bacteria are heated in a sugar syrup and the syrup exerts a non-toxic dehydrating influence on them, an increase in the thermal resistance of such cells should be observed. Vegetative cells are afforded marked protection against thermal lethality by syrups of 10 per cent. concentration upwards, but spores are not protected, probably because of their resistant spore envelope. Yeasts also did not respond to sugar protection and, indeed, sugar-tolerant yeasts (osmophilic yeasts) are well known in the spoilage of honey and maple syrup.

The protective action of sugar syrups has been well demonstrated in studying the action of germicides on *B. coli*. When the germicide is non-coagulating in its action on protein, *e.g.*, hydrogen peroxide, the presence of concentrated sugar is without effect. However, with protein-coagulating, ionic germicides, *e.g.*, mercuric chloride, 50 per cent. sugar concentration exhibits pronounced protection. The explanation I have advanced for this effect of sugar on proteins is that the protein character of the micro-organism effects an adsorption of *hydrated* sugar molecules and thus the bacteria are literally environed by an intensely hydrated zone. Glycerol, too, shows effects similar to the various sugars, and both glycerol and sugar have been employed to inhibit the thermal coagulation of egg albumin and the " coring " of frozen egg yolk.

Another direction in which sugars, especially starch conversion syrups, and dextrose are employed is the stabilising of the colour of meat. The pink colour of cured meats depends upon the absence of hæmoglobin oxidation products in the fresh meat and of the nitroso-hæmoglobin oxidation products in cured meats. In this case, the effect is primarily one of the reducing character of the sugar used, although it may well be that there is a hydration influence also.

Bacterial Purity of Sugar

No mention of sugar, however, would be complete unless attention were directed to the efforts now being made to secure that sugar supplied to canneries was free from contamination with undesirable bacteria, especially thermophiles. Not only may " flat sours " be induced in canned foods because of the presence of thermophiles in sugar, but anærobes may lead to " bloats " because of their generation of carbon dioxide and hydrogen. Some evidence has also been obtained of the presence of yeast-growth stimulants in sugars, which lead to clouding by yeast precipitation in bottled goods. Fortunately, the scientific attention given to the bacterial purity of sugar has resulted in supplies being obtainable of a satisfactory character. Nevertheless, the canning laboratory has to be on the alert.

Another important aspect of sugar is the presence of sulphur dioxide. The legally permitted amount in this country is 70 parts per million. However, only a very low amount is desirable owing to the accelerating effect of SO_2 in the corrosion of the can.

So-called " cold sterilisation " of fruit juices and wines is practised by ultra-filtration through Seitz E.K. filters, E.K. being derived from the German word *entkeimen* (=to remove germs). Coarse particles are first removed by rough filtration and the containers are sterilised by introducing sulphur dioxide which is removed just before filling by blowing out with sterile air.

Air-conditioning is a modern practice of increasing value in food factories. However, bacterial control is very necessary. It is recognised that washing air with sprays of water effects only a partial reduction in the bacterial count. The bacteria tend to accumulate in the washing water and thus the efficiency of bacterial removal from the air decreases. Carswell found that addition of benzyl-phenols (500 parts per million) to the water greatly reduced the bacterial count. A recent American development in producing sterile air is described in U.S.P. 1,736,839 (Schiller

and Wescott). The air is compressed to approximately 45 lb. per sq. in., with subsequent expansion through several successive steps to about 37 lb. per sq. in. Although extensive commercial tests have shown that this simple treatment does sterilise the air, there is no satisfactory explanation as yet forthcoming.

Breweries, dairy-produce factories, and jam and pickle factories frequently experience the trouble of mould growth on walls and ceiling. Much attention is now being given to the possibility of using germicidal paints and a paint based on halogenated oil is stated to have been very successful.

Considerable interest has been shown in the idea of using certain metal ions, especially silver, for sterilising water and clear liquids such as fruit juices and wines. The phenomenon is termed the Katadyn or Oligodynamic process. For instance, a patent to Eisenbeiss claims that compositions for lining vessels for storing or transporting beer and other fermented liquors comprise pitch + 0.1 per cent. silver resinate. (D.R.P. 638,437). Water is claimed to be sterilised by the use of granulated silver with extensive surface area per gram, *e.g.*, 1.62 sq. metres, or by silver-coated sand. Another scheme is to introduce silver by electrical action between electrodes. Although there is now a wide technical literature on this subject and repeated claims are made as to its commercial adoption for use in sterilising vinegar, wines, water and even milk, the scientific aspect is not clear and the physical chemist will need thoroughly to explore the idea experimentally before the claims can be admitted as sound. In connection with water, where traces of metals may cause concern in technical practice, the addition of sodium silicate (8 parts per million) to the flowing water is helpful. A film of ferrous silicate forms on the pipe surface. The use of silicate prevents lead poisoning and aluminium corrosion, and even protects galvanising by forming zinc silicate.

Anti-septic ice is an idea frequently mooted, *e.g.*, ice frozen from water containing 0.1-0.5 per cent. hydrogen peroxide. Ice containing sodium hypochlorite keeps fish wholesome much longer than does ordinary ice, as fresh, sterile ice-water is continually thawing out.

Fumigating Agents

Fumigation is an important method widely employed in food factories to prevent spoilage. The subject is extensive, but the salient features are here outlined. Fumigation with ethylene oxide protects cereals, dried fruits, nuts, spices, etc., and the toxicity of the fumigant is related to the respiration or to the metabolic activity of the insect exposed to the gas. A temperature of 10°-20° C. is desirable. Ethylene oxide has special value in that eggs, larvæ, and adults are all readily devitalised. A variant of technique is to place the food in a chamber to be evacuated before admitting the gas. Of the fumigating agents employed, carbon disulphide needs to be used in average doses of 3 to 4 lb. per 1000 cu. ft. of space for 24 hours at 20° C. Sulphur dioxide requires 2 lb. for 12 hours in the same cubic capacity. Ethylene oxide/carbon dioxide in the ratio of 1:9 needs 13 to 20 lb. for 24 hours at 20° C., whilst ethylene oxide/carbon tetrachloride in the ratio 3:1 requires 14 to 25 lb. for 24 hours at 20° C. Slower in action, but very effective for grain bins, is the mixture propylene dichloride/carbon tetrachloride in the ratio 3:1. The use of hydrocyanic acid gas in conjunction with a previous vacuum drawn in the chamber to be fumigated is stated to be extremely effective. Against the larvæ of the fig moth it was effective where other fumigants had failed. Eight ounces of gas per 480 cu. ft. of space for two hours were the conditions adopted. Disciplined operatives are, of course, necessary when HCN is used.

Wrappings

Much attention has lately been devoted to wrappings for protecting foods from various types of spoilage. Even the more familiar paper wraps and containers demand special measures to avoid uncontrolled development of micro-organisms in the pulp and paper mills. Thus, chlorination of water, removal of slime accumulations, and the control of fungus contamination by introducing copper sulphate at focal points—these and other measures ensure a finished paper free from infective dangers. The sterilisation of wrapping materials demands 44 hours holding at 88° C., the stacks of materials undergoing treatment not being larger than 15 cu. ft. with ample air space around each stack. It should be noted that the effect of exposure to sunlight is important for paper, since physical degradation often accompanies chemical changes in the paper.

Butter boxes may lead to mould troubles owing to the timber. It has been observed that Swedish pine timber impregnated with wax is less susceptible than white pine to mould growth, but it may give "timber taint" to the surface of the butter. Promising results obtained in New Zealand for controlling mould growth were gained by immersing the boxes for 10 minutes in a 0.1 per cent. solution of Shirlan (sodium salicylanilide).

Cheese requires special care in packaging and since 1934 the valve-vented can has been employed for curing and ageing cheese. To avoid darkening where the cheese contacts the can, lacquered tinplate is needed. Parchment, metal foils, and transparent cellulose are used for individual wrapping and the cans are preferably key-opened to permit clean removal of the contents. Wax-coated rubber sheets for packaging cheese prevent formation of rind and of surface mould growth, yet permit escape of CO_2 during curing. Metal foils, especially tin and aluminium, have found extensive application. Not only are they readily adjustable to irregular surfaces, but they are moisture-, insect-, and light-proof. They are usually backed with a protective coating of wax, vinyl resin, glassine, or paper and they are obtainable for self-sealing by application of heat.

Overcoming Store-Burn

A special problem in wrapping concerns store-burn, amber-coloured shrivelled patches on the surface of frozen meats, which arise from the evaporation of ice crystals. Tiny air pockets are thereby left behind and they scatter incident light, so making the tissue appear lighter in colour. These patches persist to some extent even after thawing, proving that the drying of the muscle fibres is an irreversible process. Excessive drying resulting in store-burn can be related to a low relative humidity of the air in the cold store and, in the case of wrapped products, to absorption of water by the wrapping material, *e.g.*, wood or paper.

Moran avoided store-burn in frozen lambs' kidneys even after 6 months' storage at −10° C., by using a paper prepared by layering aluminium foil with a parchment paper on one side and a waxed paper on the other. Similarly, store-burn in frozen poultry can be avoided by packing in boxes lined with two layers of aluminium foil/grease-proof paper, whereas grease-proof paper alone fails.

The Dewey and Almy Chemical Co. of America have developed the "Cryo-Vac" process for wrapping foodstuffs that are to be refrigerated. A very thin latex rubber balloon is drawn tightly around the package which is then vacuumised. Finishing is effected by immersion in warm water to remove wrinkles and leave a fully protected and smooth package. Complete prevention of loss of moisture is obtained and thus freezer burns are absent from the frozen food.

Probably the most important aspect of packaging materials relates to the passage of moisture through them. Carson, of the U.S. National Bureau of Standards, has examined ten factors which influence the loss or gain of moisture in packaged foods. One must agree with him that: "it is frequently found puzzling that a membrane or sheet of material that is practically impermeable to dry air may allow comparatively easy passage of the water vapour in air, which is seldom more than 2 or 3 per cent. of the mixture of gases of which the air is composed. This favouritism toward the passage of moisture vapour or atmospheric moisture shown by some food wrappings and other membranes that seem impermeable to gases is not only puzzling but may be annoying, embarrassing and expensive." Whilst it is obvious that water vapour may penetrate membranes via their defects, it is not so obvious

why penetration can occur if the membrane is entirely sound. One explanation is that owing to a difference of moisture content in the air on the opposite side of a membrane-wrapped food, the membrane material absorbs moisture and tends to equalise its distribution by diffusion or flow through the material.

The variables listed by Carson are: (1) time, so that a steady rate of transpiration may be reached; (2) area; (3) leakage; (4) thickness, although overall permeability may be much more important than unit-thickness; (5) vapour pressure difference, which as a first approximation determines the rate of passage of moisture; (6) relative humidity, a very high value increasing the rate of transpiration more than is expected from the difference of vapour-pressure alone; (7) temperature, increasing the driving pressure of transpiration and, occasionally, damaging the membranous material; (8) total pressure, which may affect the membrane by bulging; (9) diffusion in still air, as circulation is necessary for accurate test purposes in order that uniformity of humidity obtains in testing; (10) state of moisture, different materials responding differently to liquid water and water vapour.

A water-proof, grease-proof and air-tight wrapping material has been prepared by B. F. Goodrich Co., of Akron, Ohio. It is termed "Koroseal" paper and consists of koroseal (a synthetic elastic resin) applied to 40 lb. kraft paper. It flexes repeatedly without cracking, softens at 93° C. and can be sealed against itself at 200° C.

Actinic Wrappings

With the recognition of the adverse influence of light on fatty foods many researches have been conducted into the protection accorded by wrappings designed to cut out the transmission of harmful rays of light. Examining the effect of different sources of radiant energy on the flavour and anti-rachitic potency of milk, Weckel found that energy ranging in wave-lengths from 2600-3100 Å is less active in flavour changes than energy of wave-length below 2600 Å. Similar analysis of the radiation of the spectral region 3100-7000 Å indicated that radiations of 3100-3800 Å are more active in producing flavour than those of wave length 3800-7000 Å. In commercial practice of irradiating milk for condensing, the vitamin-A inactivating influence of the accompanying ozone is minimised by ventilation of the irradiating apparatus.

During photochemical studies of rancidity, determining the peroxide values of oils as affected by selective light, Coe and Le Clerc observed that corn oil and cottonseed oil would remain free from rancidity if protected from light with opaque black paper or with green paper transmitting light delimited by wave-lengths 4900-5800 Å. Morgan points out that blue and invisible ultra-violet light materially accelerate the development of rancidity in such materials as potato chips, biscuits, cakes, butter, sweets, nuts and soaps, whereas other visible light, such as red and yellow, has little effect. Consequently, rancidity-retarding wrapping may be of any visible colour except blue. On this basis has been developed a yellow, transparent, cellulosic sheeting, known as "Sylphrap R.R. Old Gold." The usual thickness of 0.001 inch has a high visible transparency but a complete ultra-violet opacity.

Enough is now known to infer that both ultra-violet and visible light greatly accelerate the oxidation of fats, the former being the more effective. The most active portion of the visible spectrum is the yellow-orange region at about 6000-6500 Å and the green between 5000-5500 Å; the least active is the far red region. Carpenter recommends green glass for bottles to protect fruit juices. In his research, flavour and turbidity of the juices were altered by light acting on the colloidal constituents present. Work published from the Heinz laboratory deals with the effectiveness of coloured samples of cellophane in retarding the oxidation of olive oil. The factors influencing protection are listed as: the quantity of light transmitted, especially ultra-violet light; the stability of the dye pigment in the sample of cellophane to the action of light. The samples showing the greatest protection were deep red, orange, violet, grass-green and yellow.

The patent literature reveals some interesting ideas for protection against light. Foils of cellulosic character or of gelatin are impregnated with esculin or a coumarin derivative (D.R.P. 638,619). The transparent coating may be combined with an organic dye that renders it opaque to light of 2900-4700 Å and non-absorbent of light of wave-lengths other than this range (B.P. 453,438). The light-filtering wrapping of a cellulosic nature (U.S.P. 2,062,179) may contain an amino-benzophenone for absorbing light rays of 3500-3700 Å.

Synthetic Fats

Lubricating Uses of Petroleum Oxidation Products

BY passing hydrogen gas through an oil in the presence of a catalyst, a hard fat can be obtained and used for frying or convertion into soap. Cottonseed oil and whale oil, for example, are convertible into edible fats or toilet soaps. Dr. Arthur Burwell, who recently received the Jacob Schoeldkopf Gold Medal of the Western New York section of the American Chemical Society, has developed this principal in his recent work on the converting of petroleum into fats. He decided to use the oxygen of the air, but soon turned to pure oxygen, achieving good results amost at once. From paraffin wax he obtained both fats and formic and acetic acids. As he proceeded with his work, he oxidised the petroleum only partially and then converted the acids into soap.

Though the soap thus obtained was not suitable for washing or for cleaning, Dr. Burwell decided that his synthetic fats might be useful in improving lubricating oils, a supposition which, in fact, proved to be correct. He found that the addition of only two per cent. of his oxidised petroleum to ordinary lubricating oil produced a material superior in lubricating properties to pure castor oil. The addition of only minute quantities of the new synthetic fats to commercial lubricating oils protects bearings against rapid wear and checks corrosion.

Further uses for Burwell's synthetic fats include their employment in the manufacture of rubber, leather, insecticides, paints, medicines, and in the treatment of metal-carrying ore.

Anti-Mildew Process

New Treatment with Morpholine and Metal Salts

A NEW process for making cotton and other fabrics mildew-resistant, developed in the U.S. Department of Agriculture, is reported by the A.C.S. *News Edition* for July 10. A public service patent assigned to Helen M. Robinson, who developed the treatment in her research in the Bureau of Home Economics, will make the process available for anyone to use without payment of royalty. The new process has several advantages over older treatments. Besides being effective as a protection against mildew and rotting, it is comparatively inexpensive, is non-toxic, and has value for home as well as commercial use.

The treatment depends upon forming an insoluble compound between morpholine and certain inorganic salts, principally those of cadmium and copper. The compound is formed directly in the fabric by immersing it under specified conditions first in a solution of cadmium or copper salts and then in morpholine.

In using cadmium chloride, the experimenters found the treated fabric had the same appearance as the untreated, with no change in colour. Though stiff when first treated, it regained its original pliability as soon as dry. The treatment is effective even after five washings and after six months of storage. The compound has no deteriorating effect on the fabric during storage. On weathering, the cadmium chloride-morpholine application was found to hold up far better than any of over 150 other treatments tested.

Purification of Glycerol

New Crystallisation Method with Alcohols

HYDROLYSIS of carbohydrates offers a ready means of producing synthetic glycerol. In application to dextrose the process is of potential importance in the preparation of glycerol from the abundant corn-starch of the Middle West as a contribution to the defence programme of the United States. Hitherto, the hydrolytic manufacture of glycerol has been open to the objection that the product was impure. Samples prepared in the laboratories of the Commercial Solvents Corporation, for example, failed to meet U.S.P. specification in four respects, *viz.*, the material was slightly coloured, had a disagreeable odour not due to acrolein, tasted bitter, and developed a black colour when treated with an equal volume of sulphuric acid.

A new approach to the problem developed by H. B. Hass and J. A. Patterson (*Ind. Eng. Chem.*, 1941, *33*, p. 615) is based on the crystallisation of glycerol in the presence of suitable solvents, and appears to be capable of yielding glycerol of any desired degree of purity. Vacuum rectification of the hydrolysis product shows that it contains impurities with boiling points very close to that of glycerol. These substances may tentatively be regarded as triols derived from hydrocarbons having more than three carbon atoms. Glycerol which passed U.S.P. specifications was easily obtained in good yield from this mixture by the following procedure. The material distilling close to the boiling point of glycerol was dissolved in an equal volume of 1-butanol, placed in a water-tight bottle, cooled, seeded and slowly revolved in an ice-water bath until crystallisation had taken place. The impurities and most of the solvent were centrifuged away from the glycerol crystals which were washed with cold acetone or isopropyl ether. Traces of solvent were removed from the glycerol by evaporation. Over 60 per cent. of the material boiling at 290° C. was thus isolated as crystalline glycerol. Of 30 solvents tested, 1-butanol, 1-propanol, 1-pentanol and liquid ammonia were found to be most suitable, crystallisation being rapid and complete from liquid ammonia, but 1-butanol being more convenient to handle and giving readier crystallisation than the other alcohols.

It seems that the function of the solvent is to reduce the viscosity of the glycerol solution without excessively lowering the fugacity of the solute. Water, methanol, and ethanol are such good solvents for glycerol that they greatly lower the fugacity of the glycerol, thus requiring the use of lower temperatures, which increase the viscosity of the solution. Butanol yields relatively dilute, mobile glycerol solutions from which nearly all the glycerol can be crystallised. Pentanol is a still poorer solvent for glycerol and the concentrations in this alcohol are so low that butanol is to be preferred.

The Chemistry of Cotton Burrs

New Uses Developed in Texas

IMPORTANT research on the utilisation of cotton burrs has recently been undertaken by C. G. Rook, of the Petrotex Chemical Co. of Texas. Mr. Rook explained that in some parts of the country cotton is pulled rather than picked, *i.e.*, the bowl or burr is pulled from the stem along with the cotton lint. In these areas separate gins are equipped to separate the burrs and attendant waste and at the end of the ginning season there are veritable mountains of burrs. Until now the burrs have been returned to the farms to be ploughed under or burnt as fuel, but Mr. Rook's experiments will eliminate this wastage.

The approximate composition of burr is as follows:

Crude pecto-cellulose	25%
α-cellulose and amorphous cellulose	18%
Water-solubles in the form of tannin and gelatin	9%
Glucose, inorganic salts	22%
Other water-solubles and lignin	18%
Aromatic tar, soluble in petroleum ether, ethylene dichloride and other organic solvents	6%
Ash, after water solubles have been removed ...	2%

(Some technical details have had to be omitted from this list as patents have not yet been taken out).

From the crude pecto-cellulose a very dense flooring-tile has already been produced. The α-cellulose is easily adaptable to paper making or esterification. The tannin is accompanied by a gelatinous substance that prohibits its use in leather or other industries using a relatively pure tannin, but a practical process for the removal of this gelatin is being developed so as to enable the tannin to be used.

When the whole burr is processed to remove some of the heavier elements it is passed through a mill in order to kink the semi-refined fibre. This material, after drying, has a woolly appearance and when loose can be filled into a wall space. Its weight is about 10 lb. per cu. ft. and it has the same insulating value as felt. It may also be treated with cooked gypsum to render it practically fire resistant. This treatment, however, raises the weight to about 20 lb. per cu. ft.

Most of this work on cotton burrs is still in the laboratory stage, but Mr. Rook has prepared various forms of insulating material, paper, cellulose xanthate, cellulose nitrate, technical tannic acid, and a fertiliser.

Reference Electrode for Salt Melts

Use of Sodium and Sodium Amalgam

THE school of V.A. Plotnikov in Kiev has published in the last few years many interesting papers on the electrochemical behaviour of salt melts, electrodeposition of metals from their fused salts, etc. Now two members of the school introduce a convenient sodium-glass or sodium amalgam-glass reference electrode for investigations of this type (*see* Skobets and Kavetski, *Zapiski* of the Chem. Inst. of the Ukrain. Acad. Sci., 1940, *7*, 287). The glass vessel is made like the ordinary glass electrode, but is filled with pieces of sodium or a sodium amalgam, instead of an aqueous solution. Into the glass capillary a platinum or copper wire is introduced, the capillary is sealed, and the whole electrode gently heated to give the sodium oxide present in sodium an opportunity to react with the glass.

The resistance of the glass membranes made by Skobets and Kavetski was some 5000 ohms at 300° C.; at lower temperatures it was much higher but no data were given. The effect of the glass composition was not investigated. When this electrode was immersed in a fused mixture of $AlBr_3$ and NaBr in which also an Al electrode was dipping, the cell thus formed had an easily reproducible electromotive force. For a mixture of 70 mol. per cent. $AlBr_3$ and 30 mol. per cent. NaBr the electromotive force was, using a sodium-glass electrode, 2.757 volts at 255° and 2.715 volts at 165°; if a sodium amalgam containing 40 wt. per cent. Na was used, the electromotive force was 1.578-1.581 volt at 300° and 1.605-1.608 volt at 220°.

Several cells of the general form:

Na amalgam | glass | 70 mol. % of $AlBr_3$ + 30 mol. % of NaBr + 10 weight % of a metal bromide | metal

were investigated at various temperatures. The table below summarises the essential results:—

	Al	Zn	Cd	Pb	Sn	Ag	Bi	Cu	Hg	
290° C.	1.581	1.652	1.719	1.773	1.884	2.046	2.220	2.322	2.350	volts
280° C.	1.596	1.663	1.724	1.768	1.876	2.070	2.218	2.319	2.346	volts

The order of the metals is, with the exception of bismuth, identical with that observed in molten aluminium bromide alone, silver being much less positive than in aqueous solutions.

If an $AlCl_3$-NaCl mixture is electrolysed between Pt electrodes at 280° C., a sodium amalgam glass electrode immersed in the melt can be used to determine the deposition potentials at the anode and cathode; in a mixture of 70% of $AlCl_3$ + 30% of NaCl these potentials were 1.38 volt at the cathode and 3.44 volt at the anode.

The electromotive forces were in all instances measured using a valve potentiometer, although sensitive galvanometers can also be employed at high temperatures, say, 300° or so.

Swiss Chemical Manufacture

Report of Activities during 1940

THE annual report of the Sandoz A.G., of Fribourg and Basle, states that in spite of difficulties and complications arising from war conditions, particularly in regard to raw material supplies, total sales during 1940 were on the whole well maintained. This was true not only of the home factories at Basle, but also of the other works in Manchester, Norwood (U.S.A.) and Seriate (Italy) operated by the Ciba, Geigy, and Sandoz concerns, all of which had a satisfactory year. Plants had been modernised and research work maintained during the past few years, and while other Swiss chemical firms were forced to make alterations in the composition and administration of their organisations owing to the war, Sandoz had remained unchanged as a wholly Swiss firm. This policy would be maintained. During the year under review, the company, in collaboration with Ciba and Geigy, took over a large majority of the shares of the Durand and Huguenin A.G. of Basle, thus obtaining an entry into the valuable indigo dye trade. Gross profits of the company for 1940 amounted to 11,462,000 fr., against 14,509,000 fr. in 1939: net profits were 5,065,000 fr., against 6,898,000 fr., and a dividend of 20 per cent. and a bonus of 7 per cent. was accordingly paid for 1940, compared with a dividend of 20 per cent. and a 15 per cent. bonus for 1939.

The annual report of F. Hoffmann-La Roche and Co., A.G., of Basle and Lausanne, revealed that the raw material situation had rapidly deteriorated throughout 1940, while export business encountered increasing transport and transfer difficulties. The company was able, however, to increase its profits. Gross income in 1940 amounted to 11,891,889 fr., compared with 10,977,070 fr. in 1939, while the net profit was 3,230,286 fr. (including 289,116 fr. brought in), compared with 3,181,116 fr. An unchanged dividend of 40.50 fr. per share was distributed on ordinary and participating shares.

Wood Distillation

The Swiss Federal Government has approved projects put forward by the Holzverzuckerung A.G., of Graubünden, for the erection of plants for liquid fuel production from wood, and has empowered the Federal Finance Department to sign an agreement with the company. As a consequence, the company has now enlarged its capital, through the issue of 2,450,000 fr. 5 per cent. cumulative preference shares to 3,042,500 fr. The new capital will be used for the erection of plants, and during the period of erection a special dividend of 4 per cent. only will be payable on the shares. The plant will be opened in stages up to the end of 1942, when it will have a normal production of 10,000 tons of acetone and 1600 tons of methyl alcohol. The sale of the acetone under the terms of the agreement, which runs until 1955, will be carried out through the Government, which will purchase the material at cost price. The sale of the methyl alcohol quota will be made through the Federal Alcohol Administration under concession terms. At a later date, the production of crystallised dextrose will also be undertaken. The quantity of wood required as raw material is estimated at about thirty thousand metric tons, or about one per cent. of the annual timber output of Switzerland. During the war, the plant will work with sawmill waste, but will later absorb the excess wood fuel output of Canton Graubünden, so as to stabilise the local timber market and provide work for local unemployed.

Production of La Fonte Electrique S.A., of Bex, in 1940, included calcium carbide, phosphoric acid, and ferrosilicon, but exportation of carbide was possible during only part of the year.

The July number of *Oxy-Acetylene Tips*, published by the LINDE AIR PRODUCTS CO. of New York, contains, in addition to other articles, one that describes how a deoxidised copper tank was successfully welded with the newly developed Oxweld No. 38 copper welding rod.

Italian Organic Chemicals

Reported Industrial Expansion

THE expansion of the organic chemical industry of Italy was mentioned in the last annual report of the president of the Montecatini companies. The new phenol plant at Cengio, it is reported, was put into operation at the end of 1940 and the considerable increase in consumption can now be amply satisfied. The vinyl acetate plant at Villadóssola also went into operation during the year. The Cesano Maderno plant for the production of polyvinyl chloride, which was constructed in 1939, has been working at full capacity. The Linate plant, taken over by the merger with the Appula, S.A., has maintained production of important items, among which are the tartaric acid and hydrosulphite groups. Also under construction is a pilot plant for the production of citric acid from fermentation citrate by an Italian process. The production of acetic aldehyde, acetone, acetic anhydride, and acetylene, by the associated company Società Elettrochimica del Toce, was favourable.

Synthetic Resins

Greater availability of phenol has permitted increased sales of resin and phenol powders. It is believed that the plant at Novara will begin the manufacture of polyamide resins during the summer; the plants for the production of chlorovinyl resins known as "Vipla," and the respective plasticisers have been working during the current year. The oxalic-acid plant of the A.C.N.A. (Aziende Colori Nazionali Affini) has started regular production, and the manufacture of phthalic anhydride was increased further to meet larger consumption. Production of other coal-tar intermediates, such as nitrobenzol, aniline, and β-naphthol, was considerable. The plant for the production of anthraquinone by catalytic oxidation of anthracene has, it is said, operated satisfactorily for several months.

Metallic Dispersions in Organic Liquids

Preparation of Colloidal Catalysts

COLLOIDAL or almost colloidal solutions of metals in organic solvents are used in therapy and as industrial catalysts. There are two main ways of preparing such solutions. In the first an electric arc burns in the solvent between two electrodes of the metal to be dispersed; the resulting metal particles are adulterated by metal oxides and decomposition products of the solvent. In the second method a metal salt is dissolved in the solvent and reduced to metal; the reduction is mostly incomplete and the acid radical of the salt has yet to be disposed of.

E. M. Natanson (*Zapiski* of the Chem. Inst. of the Ukrain. Acad. Sci., 1940, 7, 311) has successfully examined another method. Very fine particles of metal are produced by electrolysis in water, but they are transferred into an organic solvent before they have time to coalesce or to give rise to larger crystals. This is accomplished in the following way. The electrolysis takes place in a cell on the bottom of which the anode is placed. The lower half of the cell is filled with an aqueous solution of a convenient metal salt. On top of this solution is put a layer of the desired organic solvent, in most cases this contains some detergent additions. The cathode is a vertical metal rod vibrating rapidly up and down. When it is immersed in the aqueous solution some minute particles of metal are electrodeposited on it; in the next instant it rises into the organic layer where the particles fall off and are dispersed in the liquid, the permanent stirring of the liquid by the cathode and the detergent added being instrumental in this matter.

Natanson has prepared fine dispersions of iron, nickel, cobalt, lead, bismuth, tin, silver and platinum in benzene, toluene, xylene, paraffin oil, castor oil, linseed oil, and amyl alcohol.

Mystery Accident at Widnes

Process Worker's Fatal Injuries

AN open verdict was returned on Friday last week at the inquest at Widnes on Michael Joseph McAuley, aged 60, a process worker employed by Messrs. McKechnie Bros., copper sulphate manufacturers, Widnes. The verdict was that McAuley was found dead in the smelting shed of the works from laceration of the brain, but there was no evidence to show how he received those injuries.

McAuley, who was described as a very careful, and even a cautious worker, and who had always enjoyed good health, had been working on a slag crusher on the previous Wednesday afternoon. His job was to feed the crusher with slag, shovelling the material into the jaws. Although it was not his usual work, he was quite familiar with the machine, having been employed for 20 years at the works. He should have been working on an iron staging, 12 ft. high, protected by a fence at least 3 ft. high. At 8.40 p.m. the foreman of the smelting department missed him, and asked Alfred Fry, furnaceman's assistant, to look for him. Fry looked for McAuley on the staging, where he should have been, but found him crouched between the belt wheel and the slag crusher. His head was between the loose belt and the fast pulley and his right arm was fast in the belt. The motor was running free and the machine was not working because the belt was off. Fry had to cut the belt to get him free. There was fencing round the belt and pulleys. It had never been the practice to go inside the fence when the motor was running and it appeared that McAuley must have fallen from the top of the fence.

The foreman, John Newall, stated that McAuley, although normally a very careful worker, might have seen something underneath the machinery and got down into the belting, leaving the machine running, as it would have been very difficult for him to have fallen between the belts, as the belt was properly guarded. If he had fallen from the top of the fence (he could not fall through it) he would almost certainly have fallen clear.

Protective Helmets for Civilian Workers

Methods of Application

THE Ministry of Home Security, in conjunction with the Ministry of Supply, has arranged for supplies of the civilian steel helmet to be available for workers in factories and commercial premises. These helmets can now be purchased by employers at the price of 5s. 6d. each, for the use of their employees. When the helmets were first introduced last February by Mr. Herbert Morrison, the Minister of Home Security, it was stated that once the requirement of business premises and street fire parties had been met, the new helmets would be available for purchase by employers for the use of their workers. Employers are asked to co-operate by equipping all their workpeople with these helmets. They are permitted to claim the outlay as a trade expense in computing their profits for taxation purposes. It is not intended that workers should be asked to meet the cost of a helmet, and the helmets may not be sold commercially, but in industries where employees remain only a short time with the same employer, they may be asked to pay a deposit against the return of the helmet.

Applications from employers for helmets for their workers generally will be dealt with on behalf of the Ministry of Home Security by various Government Departments and Local Authorities. In the case of chemical works where more than 30 persons are employed in the factory, application should be made to District Inspectors of Factories, acting on behalf of the Ministry of Labour; in smaller works and other commercial premises the matter will be dealt with by the Local Authority (borough councils, etc.) in whose area the premises are situated. The Petroleum Department will deal with employees of petroleum plants and distribution centres; the Mines Department with mines and quarries, and the Board of Trade (Gas Department) with gas undertakings other than local authority undertakings. In all cases the application should cover all classes of employees, including managerial and office staffs and workers employed wholly or partly outside the premises, *e.g.*, transport drivers, commercial travellers, etc.

Canadian Paper-Making Industry

Developments in British Columbia

PRODUCTION of sulphite pulp at Powell River Co.'s mill will be trebled as a result of the expansion programme just announced, involving the expenditure of more than $1,000,000. Installation of new equipment to provide for this additional capacity is in line with a general stepping-up of production since British Columbia's major newsprint producer departed from its traditional policy of manufacturing only paper and turned to the pulp export trade.

Other developments of the past few months include the re-opening of the Port Mellon kraft mill by Vancouver Kraft Corporation, now under option to the paper firm of Sorg & Co. of Ohio; installation of more than $200,000 worth of equipment at the speciality mills of Westminster Paper Co. at New Westminster; additional plant for Sidney Roofing and Paper Co.; and plans for improvements in connection with B.C. Pulp and Paper Co.'s mills. Only two or three years ago the latter organisation swung over from unbleached to bleached sulphite and rayon pulp production at a cost of about $1,000,000.

Recognition of the pulp and paper industry as an essential phase of activity by the Canadian Government because of the dollar exchange factor is likely to act as a spur to expansion in the near future, although the present state of investment markets and difficulty in obtaining steel and equipment for new factories not engaged in production of war goods may hold back establishment of new mills.

Increase in production of wood pulp in British Columbia has been notable since the war shut down competitive shipments from Northern Europe and stimulated the markets in Canada and the United States. Last year, 438,000 short tons of wood pulp were produced in British Columbia, an increase of 36.5 per cent. over 1939 and 81 per cent. over 1938. Last year's output was 44 per cent. greater than the boom-time total of 1929.

A comparison with pulp development in the adjacent state of Washington shows, however, that British Columbia still has a long way to go before attaining full utilisation of her resources. Although British Columbia mills average a greater individual output, there are only seven operating plants in the province to-day, compared with twenty-five in Washington.—*Canadian Chemistry and Process Industries.*

Ink Manufacture

Summary of Developments in America

SEVERAL interesting new methods and products have appeared in the ink field recently in America. Perhaps the most spectacular is the development of perfumed inks, allied to which is the widespread use of ink "de-odorants" or "re-odorants." These, it is said, together with similar materials for paints, are now being used on a large scale. Other developments include thermo-setting inks, of which there are several different types specially formulated for quick printing and dried by passage over heated rollers or exposure to steam or even an open flame. Cold-set inks, again, are solid at ordinary room temperature; these are printed in a "molten" condition from heated rollers and solidify immediately they come in contact with the cold paper. Special inks for quicker printing of waxed paper are formulated with a wax-soluble solvent, so that the wax absorbs the solvent from the ink, which is thereby caused to set immediately without smearing.—*Paint Technology.*

Mass and Heat-Transfer Problems

An Aid to Chemical Engineering

CHEMICAL engineers will find a new aid and experimental technique in an electrical method of investigating problems in mass and heat-transfer developed at Columbia University, New York, by Victor Paschkis, Department of Mechanical Engineering. The method, as outlined in the A.C.S. *News Edition*, 1941, *19*, 13, p. 740, is entirely one of analogy; electrical potentials and resistances are used to represent the driving forces and resistances of various transfer operations. Test results are translated from volts, ohms, and amperes into terms of the problem being studied, such as temperature, over-all heat-transfer, time, or any of the familiar chemical engineering terms.

It is not necessary for a model or test section to be built. Physical characteristics of the system under test are calculated from known data and the correct electrical potential, resistance, and time are determined by conversion. By applying the calculated resistance and driving force to the electrical model, conditions of the test are simulated. Measuring the potential at any point in the electrical model gives conditions which would exist in an actual system. The method was devised by C. L. Beukin in Holland, where Mr. Paschkis also worked on it. The Research Corporation advance $5000 to build the model and since its completion many tests have been made of both purely theoretical value and great industrial interest. The chemical industry is invited to submit practical problems for solution.

Adjustable Test Speeds

One advantage of the model is the rapidity with which the work can be carried out. Under investigation at the present time is a 9-inch brick fire wall with a flame temperature of 1800° F.; thermal conductivity for the brick of 1 B.Th.U./foot/°F./hour with an over-all heat-transfer coefficient as 2 B.Th.U./square foot/°F./hour. The electrical model has been set up to reproduce those conditons, and studies are being conducted on intermittent heating and heat storage in which the fire side is heated continuously for 8 hours and then cooled for 2 hours. A complete cycle, which would take 10 hours in a practical test, required only 5 minutes. Electrical measurements were recorded automatically on several instruments. Just as this method allows time to be telescoped to facilitate experimentation, so may it be extended. If conditions were such that a practical test would require readings every few seconds or fractions of a second, the new machine could be made to drag this time out to any desired interval and thereby enable all conditions to be studied. Although not all applications of this method have been tried, answers to the following problems, it is felt, could be accurately obtained.

1. Temperature changes and time lapses within any given body.
2. Quantity of heat stored or lost in any interval of a thermal cycle.
3. Flow of fluids.
4. Mass transfer.
5. Chemical diffusion.

Many important industrial problems fall under the above headings. Metal-treatment operations such as furnace heating, quenching, annealing, cooling of castings, and furnace conditions in melting ore are all examples of some type of heat transfer and storage. The chemical industry meets analogous conditions in the melting of glass, coal carbonisation, cement manufacture, rubber vulcanisation, and plastics manufacture and moulding, while diffusion processes are found in various drying and extraction operations.

In theory the success of the method rests on the fundamental similarity in the flow of heat through a rigid body and in the electric charge in a non-inductive electric circuit. Ohm's law corresponds to Fourier's law and the concept of electric capacity of a conductor corresponds to the concept of the thermal capacity of a body. Mathematically the method is based on the identity in form between equations for thermal and electric resistance and capacity.

The theory and model have been checked by duplicating conditions of an actual experiment in determining heat loss from a cork-insulated steam pipe. In almost every instance the results have been exactly duplicated by the electric model.

Determination of Phenols

Description of New Method with Iodine

PHENOLS are usually determined by iodination in alkaline solution. A new method involving acid mediums is described by J. A. Fialkov and A. I. Gengrinovich in *Zapiski* of the Chemical Institute of the Ukrainian Academy of Sciences (1940, *7*, 125). The iodination is carried out by a solution of iodine and silver nitrate. An aqueous solution of I_2 and $AgNO_3$ is inactive, but solutions in alcohol or in aqueous alcohol, containing at least 65 per cent. of alcohol, are active.

When alcoholic solutions of I_2 and $AgNO_3$ are mixed together, the reaction $3\,AgNO_3 + 2\,I_2 = 3\,AgI + I(NO_3)_3$ takes place. Iodine trinitrate gives, with the excess of iodine, iodine mononitrate, and this is presumably the compound which reacts with phenol, according to the equation $3INO_3 + C_6H_5OH = C_6H_2I_3OH + 3\,HNO_3$. Water hydrolyses INO_3 to HOI; this is unstable and also reacts with phenols. Since hydrolysis, decomposition of HOI, and other reactions takes place also in the absence of phenolic compounds the solutions of I_2 and of $AgNO_3$ should be mixed together a short time before the analysis.

The solutions used for analysis are (1) 10 g. of iodine in 500 c.c. of alcohol, and (2) 10 g. of $AgNO_3$ in 500 c.c. of alcohol. A mixture of 100 c.c. of each of these solutions is made, the precipitate may or may not be filtered, and 100 c.c. of a 0.01 molar solution of phenol in water added. After shaking for 15 min., 50 c.c. of 10 per cent. KI in water are added, and the excess of iodine titrated 5 min. later with $Na_2S_2O_3$ (0.5 N). The precipitate now contains 2:4:6-tri-iodo-phenol.

Salicylic acid was determined in the same way, except that the iodination was carried out at 60-70° C. The reaction product was again 2:4:6-tri-iodo-phenol. 3:5-Di-iodo-salicylic acid can be obtained if less I_2 and $AgNO_3$ are used. When the prescription described for phenol is followed, resorcinol and *m*-cresol take up 3 atoms of iodine each, β-naphthol takes up two, and zinc sulphophenolate 4 iodine atoms. The concentration of solution (1) should be frequently checked.

New Application of Zirconium

Aluminium-Magnesium Alloys

NEW aluminium-magnesium alloys which can be worked at higher temperatures than other similar alloys without loss of strength and hardness are dealt with in two new American patents awarded to Philip T. Stroup of Kensington, Pa. These alloys, because of their lightness, are of particular value in making castings for aeroplanes.

The inventor has discovered that by adding a small amount of zirconium to such alloys, the resulting product takes on new properties. It can be heated to higher temperatures so that thick-walled castings can be softened to ease their subsequent bending and working, and it is claimed that when the castings cool down they are as strong as before being heated. Alloys not containing zirconium, on the other hand, could not be heated to such high temperatures because on cooling they would "recrystallise," that is, their internal structure would be so changed that the alloys lose tensile strength.

The first patent covers the addition of zirconium to copper-free aluminium-magnesium alloy; while the second relates to an aluminium-magnesium-zinc-copper alloy. Both patents are assigned to the Aluminium Company of America, Pittsburgh.

Personal Notes

DR. GEORGE LEWI, general manager of the Chema Manufacturing Company, Ltd., has been elected to the board.

MR. FRANCIS O'BRIEN has been appointed to the board of the Kolok Manufacturing Company.

MR. HAROLD GEORGE RICKARD, B.Sc., A.I.C., of Dumfries, was married to Miss Isabel Jean Pollock, at Douglas Hotel, Glasgow, on August 15.

MR. W. W. TAYLOR, public analyst for Nottingham and Mansfield, has been appointed public analyst and agricultural analyst for the City and Soke of Peterborough.

DR. FRANK BELL, D.Sc., F.I.C., head of the science department at Blackburn Municipal Technical College, has been appointed principal of the Technical College, Storey Institute, Lancaster.

DR. M. C. WHITAKER, vice-president of the American Cyanamid Co., is again chairman of the Advisory Committee for the 18th Exposition of Chemical Industries, which is to be held at Grand Central Palace, New York, from December 1 to 6.

MR. JAMES DOUGLAS LORIMER, whose election as President of the Canadian Chemical Association was announced in our issue of August 9, has now been appointed Controller of Chemicals for Canada by the Dominion Minister of Munitions and Supply.

MR. R. B. MARR, formerly chief chemist of Dominion Rubber, has been appointed general manager of the new plant of Naugatuck Chemicals, Ltd., at Elmira, Ontario, manufacturing aniline oil, accelerators, and other chemicals.

In our issue of August 9, by the inadvertent omission of the word "past," DR. J. VARGAS EYRE was made to appear as President of the British Association of Chemists. PROFESSOR F. G. DONNAN is President of the B.A.C. and has been so for two years, and Dr. Eyre should have been described as "Past President."

MR. J. ARTHUR REAVELL, F.C.S., M.I.Mech.E., M.I.Chem.E., F.Inst.F., chairman of the Kestner Evaporator and Engineering Co., Ltd., and of the Lennox Foundry Co., Ltd., and a famous personality in the world of chemical engineering and fuel chemistry, was married on August 16 at Crockham Hill, Kent, to Miss Winifred E. Haydon, younger daughter of the late George Haydon, London Stock Exchange.

Obituary

MR. JAMES WATSON, J.P., of Stocksfield-on-Tyne, who died on August 12 at his home in his 79th year, was one of the best known men in the Tyneside chemical industry. For 20 years he was manager of the United Alkali Co. at Hebburn, and in all he had been associated for 40 years with the industry. He retired from business in 1928, becoming a county magistrate for Durham in July of that year.

MR. ARTHUR BLAIKIE PURVIS, who was killed on August 14 when an aircraft of the Atlantic Ferry Command crashed after taking off, was chairman of the British Supply Council in North America. Mr. Purvis, who was born in London in 1890, included close connections with chemical industry and science in a brilliant commercial career. In 1910 he joined Nobel's Explosives Co., Ltd., where he met the future Lord McGowan. In 1914 he was appointed by the British Government to buy up all available acetone supplies in the U.S.A., gaining invaluable experience towards the post which he held in the present war. In 1924 he settled in Canada, becoming president of Canadian Explosives, Ltd., later reorganised and formed by him into Canadian Industries, Ltd. (allied with I.C.I. and Du Ponts). He was also a trustee member of the Royal Institute and a governor of McGill University. Mr. Purvis had been approved to be sworn a member of the Privy Council, but his continuous devotion to the duties of his post had delayed the actual ceremony.

MR. WILLIAM ARTHUR TAYLOR, O.B.E., A.R.C.S., superintending examiner at the Patent Office (retired), died on August 18 at St. Albans, Herts.

DR. CHARLES M. KNIGHT, who died at his home in Florida on July 3, aged 93, founded the first course in rubber chemistry ever held in an American college and was one of the organisers of the Rubber Division of the American Chemical Society.

British Chemical Prices

Market Reports

QUIET conditions are in evidence in some sections of the market and there is little of importance on which to report. In the soda products section there is a good inquiry for bichromate of soda, caustic soda, and chlorate of soda, the last-named item being in short supply. Acetate of soda is steady. Most of the potash products are available in restricted quantities with nominal prices ruling for yellow prussiate. There is no change in the position of red and white leads for which there is a moderate inquiry. A strong market is reported for citric and tartaric acids with quotations at recent levels. Conditions in the coal tar products market are, perhaps, a little less active than of late owing more to the scarcity of offers than to any lack of buying interest. There is, however, no falling off in contract deliveries, and the position in this respect appears to be proceeding satisfactorily. Creosote oil, cresylic acid and carbolic acid, both crude and crystals, are firm.

MANCHESTER.—A moderate volume of fresh business has been reported on the Manchester chemical market during the past week, but the movement into consumption of most of the leading heavy products has been chiefly against contracts. Delivery specifications, notwithstanding the holidays that are affecting conditions at the consuming end in a number of Lancashire towns, are fairly satisfactory on the whole, though the call for textile chemicals has been influenced to some extent by the industrial concentration scheme. In the tar products section, pronounced firmness is still a feature, with pitch the principal exception to the steady demand for deliveries against the orders recently placed.

GLASGOW.—There is no change in the market position in the Scottish heavy chemical trade during the past week, home business remaining steady and export inquiries rather quiet. Prices keep firm at previous levels.

Price Changes

Chrometan.—Crystals, 5½d. per lb.; liquor, £24 10s. per ton d/d station in drums.

Potassium Permanganate.—B.P., for 1-cwt. lots, 1s. 8½d. per lb., for 3 cwt. and upwards 1s. 8d. per lb.; technical, £7 15s. 3d. to £8 9s. 6d. per cwt., according to quantity, d/d nearest station.

Sodium Metasilicate.—£15 15s. per ton, d/d U.K. in 1-ton lots.

Sulphur.—Finely powdered, £19 per ton d/d; precip. B.P. 68s. per cwt.

A large section of the brochure entitled "B.D.H. Standard Stains," recently published by the BRITISH DRUG HOUSES, LTD., Graham Street, City Road, London, N.1, is devoted to a description of routine methods of staining and to standard formulæ for a variety of the staining solutions, fixatives, mordants and other preparations commonly used in microscopical work. The notes have been compiled from the laboratory records of various workers who employ B.D.H. stains. A complete list of these is given in the brochure which will be provided free of charge on application to the publishers.

The next meeting of the **Electrodepositors' Technical Society** will take place on **August 25,** at 6.45 p.m., at the Northampton Polytechnic, St. John Street, Clerkenwell, London, E.C.1. During the meeting, Mr. A. W. Hothersall, M.Sc., past president, will read an interesting American report dealing with recent progress in a number of important fields relating to electrodeposition work in the United States. Among the subjects dealt with will be: Corrosion Testing of Plated Coatings; the Du Pont High-speed Copper Bath; High-speed Zinc and Nickel Plating on Sheets; the Corronising Process; Anodising of Aluminium; Electrolytic Polishing of Stainless Steel; Electrodeposition of Metals on Bearings (Indium, Silver-lead Alloy); etc.

General News—From Week to Week

The London office of the Aluminium Union, Ltd., has been transferred from the Adelphi to Grosvenor House (8th floor), Park Lane, W.1 (Tel.: GROsvenor 4941).

It is stated that machinery for a complete sugar factory, valued at least at £70,000, recently reached India from Scotland, with nothing lost in transit. Oil refining plants for Burmah, Iran and the Near East have also arrived safely.

The Johns-Manville Corporation, manufacturers of asbestos and other insulating materials, frictional and acoustical materials, diatomaceous earth and silica products for filter-aids and fillers, etc., have been elected members of the American Chamber of Commerce in London.

A memorial to the late Lord Austin was inaugurated last Wednesday by Lord Nuffield with a personal contribution of £1000 to a fund which, it is hoped, will be administered by the Motor and Cycle Trades' Benevolent Fund in the form of an endowment.

The Board of Trade has made an Order, the Export of Goods (Control) (No. 27) Order, 1941, prohibiting, as from August 15, all exports to Japan, including Karafuto, Japanese Mandated Islands, Chosen (Korea), Kwantung Leased Territory, Taiwan (Formosa) and Manchuria, except under licence from the Board of Trade. All outstanding licences for these destinations are being revoked.

Foreign News

Sodium metasilicate manufacture has been started in Canada by National Silicates, Ltd., at their works at New Toronto.

E. I. du Pont de Nemours & Co., Inc., are reported to be planning a new plant at Detroit, Mich., for the manufacture of chlorinated solvents and other specialities.

A new acid plant to be constructed by the E. B. Eddy Co., Ltd., at Hull (Que.), near Ottawa, will utilise Canadian pyrites in place of imported sulphur.

The Philadelphia Quartz Company of California is reported to be planning the construction of a new sodium silicate plant in Tacoma, Wash., at a cost of $250,000.

Argentine casein exports during the first five months of 1941 totalled 13,534 metric tons, compared with 6098 tons for the same period of 1940.

The Manchuria Electrochemical Industry Co., a state company, is reported to be engaged in building an experimental plant for the manufacture of synthetic rubber at Kirin. Production is scheduled to begin in September.

The export of crude tartars and argols from Chile has now been restricted to 30 per cent. of the average annual exports for 1939 and 1940, so that the requirements of local manufacturers may have preference.

Imports into Peru from the United Kingdom during the March quarter of 1941 (in thousand soles) totalled 6220 compared with 5026 in the corresponding period last year. Exports were at 943 as against 20,305 in the March quarter of 1940.

The discovery of deposits of tin, tungsten and lithium at Red Sucker Lake, N.E. Manitoba, has been reported and the first group of nine claims has been issued. Red Sucker Lake is connected by tractor road with Gods Lake, where power is available, and with the Hudson's Bay Railway.

Negotiations have been opened by the Chilean government with United States authorities for the barter of copper against coal. Considerable interest is being shown in the negotiations by other South American countries, since the U.S.A. has so far been a strong critic of this type of trade.

Borax and boric acid have come under complete priority control for national defence purposes in the United States, largely on account of the prolonged strike at the Trona (California) plant of the American Potash and Chemical Co., one of the two largest producers of borax and boric acid in America.

The production of zinc in the United States during April totalled 61,439 tons of recoverable zinc as compared with 60,035 tons in March. The output for the first quarter of 1941 was 171,302 tons.

Almost two-thirds of the mercury requirements of the British Empire are now being produced in British Columbia, and arrangements are being made for the development of scheelite deposits in central British Columbia, according to a report from Montreal.

After a slight drop during April, the production of by-product sulphate of ammonia in the United States increased during May to the normal level of 2000 tons per day. According to the U.S. Bureau of Mines, the output was 61,495 tons, an increase of 6.2 per cent. over April figures of 57,917 tons.

The value of plastics production for the year 1939 in America was $79,752,810, more than two and a half times its value of $29,212,212 in 1929. The production of laminated glass or safety glass (containing plastic filler) was estimated to be worth $40,395,225.

Plastics from carbolic acid and cellulose are being produced in Shanghai, according to the U.S. Department of Commerce. Moulding powder is manufactured from imported phenol, formaldehyde, hexamine, and casein by the Sheng Te Weaving Factory. Small quantities of casein are made from soya-bean curd at both Shanghai and Tientsin.

A new synthetic lauric acid of low litre, known as Lauralene, has lately been produced by the Beacon Co., Boston, Mass. The new material has an acid number of 324 and a saponification number of 366, making it specially suitable for many applications, including rubber compounding and the production of moulded plastics.

The cessation of shipments from Italy and the curtailment of those from Japan has given the United States a bigger share in the New Zealand sulphur market. Imports of sulphur from the U.S.A. increased 133 per cent. in value last year over 1939. The total value, according to the U.S. Commerce Department, was £NZ145,750. The superphosphate industry consumed 57,079 long tons of sulphur in the year ended March 31, 1940.

A further step in the consolidation of the Japanese aluminium industry has been made with the amalgamation of the Toyo Aluminium Co., belonging to the Mitsui concern, with the Sei-Sen Chemical Co., a subsidiary of the Nippon Soda Co. The new company will be affiliated to the Mitsui concern, operating under the name Korea Light Metals Co., with a capital of 15,000,000 yen.

Owing to the shortage of copper in Spain, aluminium production is to be increased, and plans are being elaborated for the exploitation of native bauxite deposits. It is reported that a series of these deposits have already been prospected for metal content and ease of mining. Plans have also been mooted for the establishment of a large factory for the production of aluminium in Southern Spain.

New emulsifying agents frequently appear in America and almost without exception they are appropriately designated by their correct chemical titles instead of by some trade name with or without disclosure of the composition. One of the latest is 2-amino-2-methyl-1-propanol, with a boiling point of 165° C.—a colourless, water soluble, viscous, faintly ammoniacal liquid forming soaps with fatty acids somewhat similar in properties to the triethanolamine soaps.

The Chemical works at Crotone (formerly Cotrone) on the west shore of the Gulf of Taranto, South Italy, which were visited by the R.A.F. last week, were presumably the plant of the Soc. Esercizio Meridionale Ammonia (manufacturing synthetic ammonia, superphosphates, sodium nitrate and other fertilisers, sulphuric and nitric acid, etc.) and the works of the S.E.S.I. (Società Esercizio Stabilimenti Industriali), producing electrolytic zinc and cadmium (from Sardinian ores) and sulphuric acid. Great damage was caused to storage tanks and containers.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

Lubricants for textiles.—A. W. Baldwin, G. P. Crowley, T. E. Thompson, and Imperial Chemical Industries, Ltd. 8700.

Production of valuable products from glycerides.—J. G. M. Bremner, R. R. Coats, D. A. Dowden, A. W. C. Taylor, and Imperial Chemical Industries, Ltd. 8702

Production of cellulose derivatives.—H. Dreyfus. 8933.

Plastic sheeting.—E. I. Du Pont de Nemours and Co. (United States, July 10, '40.) 8705

Polymerisation of organic materials.—E. I. Du Pont de Nemours and Co., W. S. Calcott, and H. W. Starkweather. 8788.

Applying protective coatings to surfaces.—C. F. Flint, H. Taylor, and Imperial Chemical Industries, Ltd. 8974.

Aluminium solder.—J. M. Gardner. 8842.

Manufacture of chlorinated products.—G. W. Gladden and W. W. Cocker. 8851.

Manufacture of adermine.—F. Hoffmann-La Roche and Co., Akt.-Ges. (Switzerland, Sept. 2, '40.) 8930. (Switzerland, Sept. 10, '40.) (Cognate with 8900.) 8991. (Switzerland, Sept. 11, '40.) (Cognate with 8900.) 8992. (Switzerland, Sept 16, '40.) (Cognate with 8990.) 8993. (Switzerland, March 7.) (Cognate with 8990.) 8994.

Catalysts.—International Catalytic Oil Processes Corporation. (United States, July 25, '40.) 8745 (United States, Aug. 3, '40.) (Cognate with 8745.) 8746. (United States, Nov. 30, '40.) (Cognate with 8745.) 8747. (United States, Dec. 11, '40.) (Cognate with 8745.) 8748. (United States, Dec. 27, '40.) (Cognate with 8745.) 8749.

Separation of metallic oxides.—A. P. Laurie. 8759.

Conditioning surfaces of metal bodies.—Linde Air Products Co. (United States, Aug. 10, '40.) 8684

Treatment of zinc, etc.—Magnesium Metal Corporation, Ltd., and W. K. J. Pearson. 8743.

Treatment of iron, etc.—Magnesium Metal Corporation, Ltd., and W. K. J. Pearson. 8744.

Production of a solubilising agent for the preparation of aqueous solutions of water-insoluble bodies.—R. H. Marriott. 8697, 8698.

Alloys.—Mond Nickel Co., Ltd., and F. Hudson. 8812.

Manufacture of continuous sheets, etc., of plastic material. Monsanto Chemical Co. (United States, July 31, '40.) 9008.

Production of aqueous emulsions.—A. Müller. 8956.

Means for recording the flow of fluids.—Procter and Gamble Co. (United States, July 12, '40.) 8824.

Manufacture of sulphuric acid.—S. Robson, T. B. Gyles, and National Processes, Ltd. 8875.

Manufacture of isoalloxasine derivatives.—Roche Products, Ltd., F. Bergel, A. Cohen, and J. W. Haworth. 9001.

Bactericides.—F. L. Rose and Imperial Chemical Industries, Ltd. 8786.

Ammonium sulphate production.—Semet-Solvay Engineering Corporation. (United States, Sept. 25, '40.) 8721.

Insecticides.—Shell Development Co. (United States, Sept. 12, '40.) 8903.

Manufacture of dyestuffs.—Soc. of Chemical Industry in Basle. (Switzerland, July 19, '40.) 8871. (Switzerland, June 16.) (Cognate with 8871.) 8872.

Manufacture of condensation products.—Soc. of Chemical Industry in Basle (Switzerland, July 20, '40.) 8986.

Production of butyl alcohol and acetone by fermentation.—Wisconsin Alumni Research Foundation. (United States, July 30, '40.) 8809.

Apparatus for distillation of carbonaceous materials.—H. W. Witney. 8938, 8939.

Reduction of aluminium from its ores.—H. N. Wright. 8963.

Treatment of castings of magnesium and magnesium alloys.—Yorkshire Dyeware and Chemical Co., Ltd., J. G. Bedford, R. C. Storey, and R. W. D. Kirkham. 8924.

Complete Specifications Open to Public Inspection

Synthesis of 2-amino-thiazoles.—E. R. Squibb and Sons. Jan. 13, 1940. 17217/40.

Manufacture of cellulosic sheets and films.—British Cellophane, Ltd. Jan. 12, 1940. 192/41.

Process for the manufacture of alkyl substituted derivatives of hydroquinone and naphthohydroquinone.—Roche Products, Ltd. Jan. 10, 1940. 274/41.

Synthetic resinous compositions.—British Thomson-Houston Co., Ltd. Jan. 9, 1940. 316/41.

Catalytic cracking of hydrocarbon oils.—Standard Oil Development Co. Dec. 9, 1939. 1737/41.

Catalytic treatment of hydrocarbons—Standard Oil Development Co. (Cognate Application, 1739/41.) Dec. 5, 1939. 1738/41.

Method of and apparatus for the interaction of gaseous fluids with solid materials, and more especially for the catalytic conversion of hydrocarbon oils.—Standard Oil Development Co. (Cognate application, 1741/41.) Dec. 30, 1939. 1740/41.

Catalytic treatment of hydrocarbon oils.—Texaco Development Corporation. Dec. 30, 1939. 1861/41.

Catalytic conversion of hydrocarbons.—Standard Oil Development Co. Dec. 29, 1939. 1897/41.

Process for the catalytic treatment of relatively high boiling hydrocarbons.—Standard Oil Development Co. Dec. 30, 1939. 1898/41.

Process for the production of high-octane motor fuels.—Standard Oil Development Co. Jan 3, 1940. 1899/41.

Catalytic treatment of hydrocarbon oils.—Standard Oil Development Co. Dec. 28, 1939. 1961/41.

Catalyst.—Standard Oil Development Co. Dec. 27, 1939. 1962/41.

Process for the cafalytic treatment of hydrocarbon oils.—Standard Oil Development Co. Dec.30, 1939. 2010/41.

Apparatus for the heat treatment of animal material, especially from whale, herring, or other fishes, for the production of oil and dry stuff.—J. Fosse. Nov. 1, 1939. 7536/41.

Complete Specifications Accepted

Production of bituminous materials.—N. V. de Bataafsche Petroleum Mij.). March 20, 1939. 537,563.

Devices for killing weeds and the like.—J. Allen and Sons (Oxford), Ltd., and G. H. Bates. March 8, 1940. 537,564.

Method of stabilising the colour of vegetables during canning and storage.—American Can Co. March 16, 1939. 537,535.

Catalytic alkylation process for the manufacture of saturated hydrocarbons.—Standard Oil Development Co. June 1, 1939. (Cognate application, 7008/40.) 537,589.

Manufacture of ester salts of leuco-vat dyestuffs. Durand and Huguenin A.-G. May 15, 1939. 537,592.

Separation of olefins from mixtures of hydrocarbons.—Standard Oil Development Co. Dec. 29, 1938. (Divided out of 537,468.) 537,497.

Preparation of urea-formaldehyde polymer for papermaking.—Brown Co. (Aug. 23, 1938). 537,813.

Pest-control compositions.—Imperial Chemical Industries, Ltd. (E. I. Du Pont de Nemours and Co. Sept. 18, 1939. 537,857.

Thiocyano esters.—Röhm and Haas Co. (Nov. 8, 1938). 537,815.

Hydrocarbon lubricating-oil compositions.—Standard Oil Co. of California. (Oct. 4, 1938). 537,816.

Manufacture of surface-active compounds.—Imperial Chemical Industries, Ltd. (E. I. Du Pont de Nemours and Co.). Oct. 6, 1939. 537,841.

Process and plant for manufacturing fuming sulphuric acid.—Techno-Chimie and F. Salsas Serra. (Oct. 10, 1938). 537,817.

Production of synthetic resinous compositions.—E. I. Du Pont de Nemours and Co. (Jan. 3, 1939). 537,827.

Manufacture of azo dyestuffs.—Soc of Chemical Industry in Basle. (Jan. 5, 1939). (Cognate application, 305/10) 537,831.

Production of cuprene.—A. Wassermann. Jan. 9, 1940. 537,869.

Producing alkylated aromatic compounds.—A. Abbey (Dow Chemical Co.). Jan. 10, 1940. 537,894.

Treatment of cellulose derivative filamentary materials with liquids.—R. W. Moncrieff and H. Bates. Jan. 11, 1940. 537,923.

Plasticisers.—E. Higgins. (Jan. 21, 1939). 537,925.

Hydrocarbon vapour burners.—S. W. Bates. April 15, 1940. 537,892.

Amended Specifications Published

Hardening processes for magnesium base alloys.—High Duty Alloys, Ltd., and another. 474,812.

Anodising of aluminium and its alloys.—Electro-Metallurgical Research Co., Ltd. (in liquidation), and others. 476,161.

Manganese alloy.—W. J. Tennant. 526,033.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

MANCHESTER OIL REFINERY, LTD., London, E.C. (M., 23/8/41.) July 9, £55,000 (not ex.) charge, to N. M. Rothschild & Sons, charged on certain moneys (ranking in priority to trust deed dated Aug. 23, 1939). *£290,352. Dec. 31, 1940.

BRITISH CERAMICS & CRYSTAL, LTD., Brierley Hill. (M., 23/8/41.) Aug. 5, series of £9000 (not ex.) debentures, present issue £5000; general charge. *Nil. Oct. 17, 1940.

Satisfactions

BRITISH RAYOPHANE, LTD., Wigton. (M.S., 23/8/41.) Satisfaction July 28, of debentures registered Oct. 30, 1936, to the extent of £2,500.

METAL TREATMENT, LTD., London, S.W. (S., 23/8/41.) Satisfaction July 24, £2636 1s. 6d., registered Dec. 16, 1940.

County Court Judgment

LANDORE ZINC CO., LTD. (a firm), Landore Zinc Works, Landore. (C.C.J., 23/8/41.) £25 18s. 8d. May 2.

Companies Winding-Up Voluntarily

OXLEY ENGINEERING CO. (HOLDINGS), LTD. (C.W.U.V., 28/8/41.) July 30. P. M. C. Wilson, Martins Bank Chambers, Park Row, Leeds 1, appointed liquidator.

VITREA UNION BOTTLE & GLASSWARE CO., LTD. (C.W.U.V., 28/8/41.) July 30. E. D. Miller, 150 Southampton Row, W.C., appointed liquidator.

Company News

Minimax, Ltd., have declared a final dividend of 8 per cent. and a 4 per cent. bonus, making a total for 1940 of 20 per cent. Profits for the year were £60,168, compared with £60,746.

Greeff-Chemicals Holdings have declared a final dividend on ordinary shares of 7 per cent., making 10 per cent. (12½ per cent.) for 1940.

John Dale Metal Containers announce a net profit for 1940 of £10,631 (£6197), and have declared no dividend on the ordinary shares (same).

The Bradford Dyers' Association announces a profit, after taxation, of £373,857 (£231,556), and as already known five years' dividends are being paid on the preference capital, bringing the dividend up to the end of 1937.

The Metal Box Co., Ltd., have declared a final dividend of 10 per cent. (making 15 per cent. for the year) plus 2½ per cent. bonus, less income tax, on the ordinary stock. Profit available for distribution fell from £303,996 to £199,705.

W. J. Bush & Co., Ltd., announce profit after depreciation for 1940, of £153,013 (£120,700), and have declared a final dividend of 6 per cent. (same) on ordinary shares, again making 10 per cent.

Timothy Whites and Taylors, Ltd., announce trading profits for the year ended December 28 last of £393,129 (£373,541), less tax, leaving a net profit of £157,651 (£185,521); the dividend on the ordinary capital, as already announced, is maintained at 30 per cent. for the year.

The directors of **Beechams Pills, Ltd.,** announce a profit for the year ended March 31 of £1,085,893 (£1,055,615), and, as already announced, the dividend on the deferred capital is unchanged at 28½ per cent. Of the subsidiary companies **Beecham Maclean Holdings, Ltd.,** are paying an interim dividend of 18 per cent., and a final dividend of 7¼ per cent., making 25¼ per cent. for the year to June 30 (27 2/5 per cent.); an interim dividend of 14.4 per cent. has been declared by **Eno Proprietaries, Ltd.,** for the year to March 31, while **Macleans, Ltd.,** are paying an interim dividend of 29½ per cent. (42½ per cent.), and at the same time an interim of 12 per cent. in respect of the current year is announced; **Yeast-Vite, Ltd.,** have declared a dividend of 60 per cent. for the year to March 31 (52½ per cent.).

Chemical and Allied Stocks and Shares

IMPROVEMENT of business in Stock Exchange markets has been reflected by an upward movement in security values. Sentiment was assisted by the trend in British Funds, which was inclined to benefit from expectations that a large part of the proceeds from the latest requisitioning of Canadian stocks will be reinvested in gilt-edged securities. In many directions yields on industrial shares are now very moderate, and there seems little likelihood of improved dividends during the war period. Nevertheless, despite the better prices, there is little disposition to sell, and many securities have remained in small supply in the market.

Awaiting the interim dividend announcement, Imperial Chemical have shown a steady tendency, and at 32s. were virtually unchanged on balance, while the preference units remained around 32s. 9d. Borax Consolidated deferred were again a firm feature at 28s. 6d., while elsewhere, Fison Packard transferred at one time up to the higher price of 35s. Greeff-Chemicals 5s. ordinary transferred around par, and Lawes Chemical at 7s. 9d., while business at 4s. 6d. was shown in Blythe Colour shares. Following publication of the financial results, W. J. Bush 5 per cent. £5 preference shares, which are firmly held and do not often change hands, were dealt in at 90s. Business up 5s. 9d. was recorded in British Glues 4s. ordinary, and there were again rather more dealings in various other smaller-priced shares, Erinoid having transferred at over 1s. and British Industrial Plastics at over 3s. Various preference shares changed hands, including Morgan Crucible first preference at 24s., and the second preference at 21s. 3d.

Barry & Staines were again more active, and have further improved from 32s. 3d. to 34s. 9d. at the time of writing, while Nairn & Greenwich held their recent rise to 58s. 9d. Some attention was again given to General Refractories, which at 10s. 1½d. more than held their recent rise, and Imperial Smelting were 12s. 3d. compared with 11s. 9d. a week ago. Awaiting the interim dividend announcements, British Aluminium were higher at 47s. 6d. and British Oxygen remained firm at 67s. 6d. Lever & Unilever were slightly higher at 26s., while elsewhere, Cerebos shares were better in price, and International Paint were 1s. 3d. up at 88s. 9d. Pending the dividend announcement, Wall Paper Manufacturers deferred units moved higher to 26s. British Plaster Board shares were again active around 17s. At 39s. British Oil & Cake Mills preferred shares lost part of an earlier improvement.

The units of the Distillers Co. have been a steady feature at 68s.; on the basis of last year's 16¼ per cent. dividend the yield is only 4¾ per cent., but if profits had been fully distributed, a further 10 per cent. could have been paid in dividend. United Molasses 6s. 8d. ordinary were higher at 26s. 6d., at which the yield is approximately 5 per cent. based on last year's 20 per cent. dividend. In addition to the latter there was also a special cash payment of 2½ per cent. from profits on investment sales. Iron and steel securities appeared to be rather less active, but further improvement in prices were shown on balance, and Dorman Long were 23s. 9d., compared with 23s. a week ago. Elsewhere, B. Laporte were again around 60s., and Monsanto Chemicals 5½ per cent. preference 22s. 6d.

In other directions, Boots Drug eased from 36s. to 35s. 6d., and at 9s. 6d. Beechams Pills 2s. 6d. deferred shares failed to keep best prices touched in the past few days, but they were slightly better on balance for the week. At 21s. 3d. Timothy Whites also lost part of an earlier improvement. Elsewhere, activity was shown in Triplex Glass on market hopes of a better dividend than the 5 per cent. paid for the previous year, and on balance the price has moved up from 22s. to 24s. 10½d. Firmness was shown in Murex, Turner & Newall and most other leading industrial securities. Awaiting the Anglo-Iranian dividend decision, movements in oil shares have been moderate in character. Textile securities moved better, aided by the excellent improvement shown by the results of Bradford Dyers.

New Companies Registered

New Iodine Products, Ltd. (368,305).—Private company. Capital: £1000 in 10,000 shares of 2s. each. To acquire from Chas. R. Ritter the sole right to manufacture, market and sell a provisionally protected process relating to the use and application of iodine, and to carry on the business of manufacturers of and dealers in chemicals, drugs, medicines, etc. Subscribers: Ronald T. Cornwall and Blanche Paviour. Solicitors: E. Stuart Hunt, 1 Leadenhall Street, E.C.3.

CLASSIFIED SECTION

NOTE: Trade announcements, other than strictly second-hand and job lines, cannot be inserted in these pages except by firms whose advertisements run in the display columns

APPOINTMENT VACANT

MAINTENANCE ENGINEER wanted for Large Chemical Works in Yorkshire, permanency for suitable man. Applications stating age, experience and qualifications in confidence to Box No. 2028, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

EDUCATIONAL

Great Possibilities for

QUALIFIED CHEMICAL ENGINEERS

Key Men in Wartime and Afterwards.

Many of the finest posts in Britain in Wartime are reserved for Chemical Engineers. The same will be the case when the war is over. The vast technique and experience now being applied to Chemical Technology for war purposes will then be suitably utilised in reconstruction, and in trade and commerce.

Enrol with the T.I.G.B. for the A.M.I.Chem.E. Examinations in which home-study Students of The T.I.G.B. in the last two successive years have gained:—

TWO FIRST PLACES. TWO "MACNAB" PRIZES.

Write to-day for "The Engineer's Guide to Success"—free, containing the world's widest choice of Engineering Courses—over 200—the Department of Chemical Technology including Chemical Engineering Processes, Plant Construction, Works Design and Operation, and Organisation and Management—and which alone gives the Regulations for A.M.I.Chem.E., A.M.I.Mech.E., A.M.I.E.E. C. & G. B.Sc., etc.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN,
219 Temple Bar House, London, E.C.4.

UNIVERSITY OF MANCHESTER.

CHEMISTRY COURSES.

PROSPECTUS containing full particulars of the LECTURES and LABORATORY COURSES qualifying for the Degrees in Chemistry will be forwarded on application to the REGISTRAR. Applications for admission to the Research Laboratories should be made to the Director of the Chemical Laboratories. The Session commences on Thursday, September 25th.

FOR SALE

'Phone 98 Staines.

STEEL JACKETED PAN 6 ft. 0 in. by 3 ft. 6 in. dia. Peerless Dough Mixer, electric drive; Dehne Filter Press, 23 chambers, 25 in. square.
HARRY H. GARDAM & CO., LTD., STAINES.

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each. Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills, Preston, Lancs. Phone 2198.

COMBINED AUTOMATIC WEIGHING, MEASURING and Mixing Plant, with six weighers, capacity about one ton per hour, with 20 h.p. and 7½ h.p. motors, elevator, conveyor, vibro-screen, etc. Can be seen erected in Kent. THOMPSON AND SON (MILLWALL), LTD., Cuba Street, Millwall, London, E.14. East 1844.

100 REBUILT Hydro Extractors by all leading makers from 18 in. upwards with countershafts attached and safety covers. Jacketed Steam Pans, various sizes. List on request. Seen at Randalls, Arundel Terrace, Barnes. Telephone: Riverside 2436.

600

HORIZONTAL Cast Iron Filter Press by S. H. Johnson, with washing blades, type A.2.L., containing 58 plates and 59 frames, 46 in. square, capacity approx. 115 cu ft. enclosed lug feed and wash port, 5 in. dia. inlet port.

Timber Lead Lined Tank, 6 ft. 9 in. long by 3 ft. 0 in. wide by 4 ft. 0 in. deep, 3 in. thick timbers.

Horizontal "U" Shaped Steam Jacketed Mixer by Hind & Lund, fitted with reversible type agitating gear, pan 5 ft. 11 in. long by 2 ft. 3½ in. wide by 2 ft. 6 in. deep; fast and loose pulley drive.

Copper Steam Jacketed Mixing Pan, pan 2 ft. 1 in. dia. by 1 ft. 9 in. deep inside, mounted on brass trunnions and arranged with tilting handle fitted with locking device, suitable for 100 lbs. per square inch pressure.

"Wembley" Refrigeration Installation by J. and E. Hall, comprising 3 in. by 3½ in. single cylinder N.H.3 Compressor, complete with driving motor, condenser, evaporating coils, etc.

Horizontal Mild Steel Unjacketed Cylindrical Mixer, 6 ft. 0 in. long by 2 ft. 6 in. dia. at ends, 3 ft. 0 in. dia. in centre, mounted on mild steel stand.

Timber Lead Lined Tank, 6 ft. 0 in. long by 2 ft. 6 in. wide by 2 ft. 6 in. deep, 2½ in. thick timbers, ¼ in. thick lead.

Horizontal Unjacketed "U" Shaped Mixer by David Thompson, Ltd., trough 14 in. by 14 in. by 12 in. deep, fitted with double "Z" blades, mounted on cast iron stand and driven through machine cut gears by fast and loose pulleys.

GEORGE COHEN
Sons & Company, Limited,
STANNINGLEY, LEEDS.

AIR COMPRESSORS.

C.Ft.	Lbs. Pressure	Maker	Drive
425	30	Reavell, vertical	Belt
400	50	Lacy-Hulbert Type	Belt
310	100	Ingersoll Rand ER1	Belt
150	100	Ditto	Belt
50	100	Ditto	Belt
450	30	Alley & MacLellan	Motor
670	30	Tilghman	Belt
30	60	Reavell, Axiel	Belt
400	30	Alley & MacLellan, 120 lbs. Steam	

Also other Machines.

S. C. Bilsby, Crosswells Road, Langley, Birmingham.
'Phone: Broadwell 1359.